The Registrar,  
University of Calcutta,  
CALCUTTA.

Sub: Addendum

Ref: Sri Nabakumar Das, Department of Physiology, Calcutta University, 92, Acharya Prafulla Chandra Road, Calcutta 700009, regarding Thesis entitled "Lung Function and Physical Fitness in Twins", for Ph.D.(Sc) - Vide letter No. 2404/Ph.D(Sc) Viva dated 19.10.1995.

Sir,

With the above reference Sri Nabakumar Das has done the necessary corrections as per suggestions and comments given by both the Indian and Foreign Examiners. This is to certify that I am satisfied with necessary corrections done by him.

With sincere regards,

Yours sincerely,

Prof. S. Chatterjee,  
SUPERVISOR
ADDENDUM

Sri Nabakumar Das, Department of Physiology, Calcutta University, 92, Acharya Prafulla Chandra Road, Calcutta 700009, regarding Thesis entitled "Lung Function and Physical Fitness in Twins", for Ph.D.(Sc) - Vide letter No. 2404/Ph.D(Sc) Viva dated 19.10.1995.

Necessary Corrections on Notes on Comments of Indian Examiner are made in the following ways:

1. **Clarification 2:**
   
i) IC = It is the tidal volume and the volume of air taken during maximum inspiratory effort.
   
ii) IRV = It is the volume of air that can be inhaled by forced inspiration over and above the tidal volume.
   
iii) PEFR = This is the maximum flow which can be sustained for a period of 10 mins during a forced expiration starting from total lung capacity.


3. **Clarification 4:** All the anthropometric measurements were higher, apparently, in 18-27 year twin than in 10-17 year twin population.

4. **Clarification 5:** The discrepancies in anthropometric measurements and lung function measurements between MZ and DZ twins might be due to age. But, finally, to avoid the effect of age on the study, residual scores were obtained after adjustment for observed values with age separately using simple regression equation.

5. **Clarification 6:** Twin studies have disclosed that bronchial asthma, once believed to be entirely of genetic, is one of the typical diseases in which genetic and environmental factors play Contd.....2
the role in the initiation, clinical course and pathophysiological pictures.

6. **Clarification 7**: Subjects were collected from the rural areas mainly and few were of semiurban areas, 200 Km from Calcutta. Therefore, the effect of pollution on the lung function measurements were avoided in the study. However, pollutants may reduce the lung functions. This is possibly due to irritation of pulmonary airways.

7. **Clarification 8**: Socio-economic conditions, nutritional standards, active life style etc. of twins were not analysed separately in the study. Therefore, differences in lung function measurements of MZ and DZ twins might be due to those factors to some extent.

8. **Clarification 9**: Values were apparently smaller in male than those of female, but the values were not statistically significant.

9. **Clarification 10**: Anderson *et al* (1984) have reported that the boys exhibited a greater lung volume than the girls, age ranged 8-18 years.

10. **Clarification 11 (References)**:


    Contd....3

Necessary corrections on Notes on Comments of Foreign Examiner are made in the following ways:

1. Clinical importance of the study:
   i) The study might be helpful in the early detection of subjects with different respiratory disorders mainly chronic obstructive lung disease, large and small airway disease, asthma etc. products of genetic and environmental factors.

   ii) Deteriorations in lung volumes must be critically examined in patients with respect to relative importance between genetic and environmental (acquired) factors. When genetic influence is thought to be larger than environmental factors, ventilatory responses may not be easily restored by therapeutic measures such as oxygen inhalation and respiratory stimulant. Hence, present study may help to identify individuals with the susceptible genotype. If we could find that acquired factors are important, we can take steps to minimize exposure to environmental factors in only those individuals.

   iii) This study would help to conduct antismoking efforts in populations that are genetically liable for the development of chronic lung disease of those individuals.

2. Objectives 1 and 2:
   i) Lung function measurements are influenced by different anthropometric measurements comprising height, weight, BSA, chest circumference etc. in the study. Therefore, anthropometric measurements were taken in the investigation to eliminate the effect of those variables on the influence of genetics, environments and heredity on lung function measurements.

   ii) The another aspect of this objective was that the readers might be encouraged to refer to our reports on familial aggregation of pulmonary function. Pulmonary functions are highly heritable components in the study. Parental history might be required in this regard. Jackson (1842) Contd....5
states that occurrence of pulmonary emphysema is higher in parents of patients than parents of healthy subjects.

3. **English language**:

Translation of English language into other regional languages might be helpful in the intercommunication from culture to culture.

4. **Symbolically expression of genetic studies of twins**:

MZ twins share common genetics and environments and DZ twins share common environments but different genetics. Hence, the comparison of genetic studies of the two twin types is symbolically expressed in the following corrected form:

\[
\begin{align*}
\sigma^2_{DZ} &= E + H \\
\sigma^2_{MZ} &= E \\
\sigma^2_{DZ} / \sigma^2_{MZ} &= H
\end{align*}
\]

E, H = Differences in environmental and heredity respectively.
\(\sigma^2_{DZ}\) = Difference in score between DZ.
\(\sigma^2_{MZ}\) = Difference in score between MZ.

5. **Anthropometric study in MZ and DZ twins separately**:

Both the lung function and fitness measurements, in the study, are influenced by anthropometric measurements. On the other hand, anthropometric and lung function measurements are mainly genetically influenced variables, where the major fitness measurements are environmentally influenced variables. In order to, therefore, eliminate the effect of genetically influenced anthropometric measurements on lung function and fitness measurements, simple regression equations are used in the study. Therefore, anthropometric studies in MZ and DZ twins were done separately.

The heritability estimates of different anthropometric measurements are obtained based on the Holzinger's formula.